

**Amendments to the Drawings:**

FIG. 3 has been amended to include functional blocks corresponding to certain claim terms as requested by the Examiner.

### REMARKS

The objections and rejections presented in the Office Action dated August 3, 2007, have been considered and are addressed below. Amendments to the claims are discussed in association with the traversals of the rejections. Claims 1-33 are pending in the application. Reconsideration and allowance of the application are respectfully requested.

The Examiner's time and efforts in reviewing proposed amendments to the claims and discussing the same are greatly appreciated. Per the discussion by telephone between Examiner Wong and Eric Curtin (Reg. No. 47,511) on September 28, 2007, it was understood that the claim objections and rejections under §§101 and 112 would be removed, and further that the objection to the drawings would be removed as well with the entry of this Amendment. The following discussion addresses some of these objections and rejections, and further addresses the rejections over cited art.

The drawings stand objected to under 37 C.F.R. §1.83(a) as allegedly not showing claimed limitations directed to a program controller, fitness evaluator and selector; the Examiner has required that the exact language used in the claims be present in the drawings. Applicant submits that 37 C.F.R. §1.83(a) does not require that the drawings use the exact language used in the claims, and further indicates that graphical drawing symbols together with description in the specification are sufficient where no further illustration is essential for a proper understanding (*i.e.*, by one of skill in the art). This is consistent with M.P.E.P. § 2163.02, which indicates that "(t)he subject matter of the claim need not be described literally (*i.e.*, using the same terms or *in haec verba*) in order for the disclosure to satisfy the description requirement." Notwithstanding this, Applicant has amended FIG. 3 to show functional blocks corresponding to certain claim limitations. The following discussion supports these amendments.

In the instant application, the indicated terms are well-described in connection with the drawings and shown implementations. In an effort to assist the Examiner, the

Applicant has pointed (in the following discussion) to various portions of the specification made in connection with the figures. Regarding the term "program controller" (now added to FIG. 3), the description of FIG. 3 at paragraph 0030 provides an example embodiment as follows:

In one implementation, a first set of designs is read from the memory 330 and programmed to the programmable device 310 using the program input 314, data is input thereto at data input 312 and results are output to the evolution controller 320 using result output 316.

In this embodiment, the evolution controller 320 carries out functions that include programming a programmable device 310, via a program input 314 as shown in FIG. 3. This description provides example support for the claimed limitations directed to a program controller (as in claim 29):

a program controller configured and arranged to sequentially program the programmable device with one design at a time, the input signal being sequentially applied to single designs to generate the associated result signals

Regarding the term "fitness evaluator" (now added to FIG. 3), Applicant refers to the example described in the above-recited portion of paragraph 0030 describing FIG. 3 together with the example embodiment described in paragraph 0033:

Result outputs received by the evolution controller 320 are used to determine a consensus result. The consensus result is used to evaluate the designs stored in the memory 330 for evaluating the fitness thereof.

In this embodiment, the evolution controller 320 carries out fitness evaluation functions, showing clear support for claimed limitations directed to a fitness evaluator (as in claim 25):

a fitness evaluator configured and arranged to determine a consensus result as a function of associated result signals from at least two of the plurality of designs and to determine an associated fitness level of each design of the plurality as a function of the associated result signals and the consensus result

Regarding the term "selector" (now added to FIG. 3), Applicant refers to paragraph 0033 again, which for an example embodiment goes on to state:

The evolution controller 320 then generates a new design using the consensus result as an evaluation function, and replaces one of the unfit designs stored in the memory 330 with the newly-evolved design.

In this embodiment, the evolution controller 320 selects and replaces a selected unfit design with a new design, showing clear support for claimed limitations directed to a selector (as in claim 25):

a selector configured and arranged to select and replace one of the plurality of designs with a new design as a function of the associated fitness level of the selected design

In view of the above in-depth examples and the amendment to FIG. 3, the drawings meet the requirement under 37 C.F.R. §1.83(a), and the specification correspondingly meets any related written description requirement. Furthermore, the Drawings have been amended per the Examiner's suggestion to show example functional implementations of the above-referenced terms. Applicant therefore understands that the objection to the drawings will be removed.

The objections to claims 4, 20, 25-33 under 37 CFR 1.75(c) are contrary to various discussion in the specification and are therefore improper. In an effort to help further illustrate the nature of the claimed subject matter, Applicant has pointed to specific portions of the specification that describe example embodiments that relate to the objected-to claims.

The continued rejection of claim 4, requiring that it repeat an entire clause from claim 3 (from which it depends) in order to properly depend is unfounded and unsupported by any relevant law or the M.P.E.P. Applicant maintains that there is no requirement that a dependent claim repeat such limitations; the claim is proper where one of skill in the art would understand the scope of the claim. Here, the rejection does not allege any confusion. Notwithstanding this, in an effort to facilitate prosecution, Applicant has amended claim 4 to include the entire relevant clause in claim 3 from which it depends.

Regarding claim 20, paragraph 0032 describes an example approach to generating a result signal by programming and reprogramming a programmable device with first and second designs as follows:

In one implementation, a first set of designs is read from the memory 330 and programmed to the programmable device 310 using the program input 314, data is input thereto at data input 312 and results are output to the evolution controller 320 using result output 316. A second set of designs is then read from the memory 330 and programmed to the programmable device 310 with the evolution controller 320, replacing the first set of designs. Data is then input to the second set of designs, with result data being output to the evolution controller 320. The evolution controller 320 uses the result data from the first and second sets of designs to generate the consensus result.

In view of the above-cited portion of paragraph 0032, the Examiner's assertion that "programming and reprogramming has nothing to do with generating result signal" is in direct contradiction with the specification. The Examiner's subsequent discussion in the response to arguments in the Final Office Action, requiring that claim 20 can only be linked to claim 1 via the determination of a consensus result is not understood. The first clause after the preamble of claim 1 discusses generating associated result signals, and the second clause is directed to determining a consensus result as a function of the generated result signals. Claim 20, which is directed to the first of these two clauses (generating the associated result signals), is thus not only proper, it is abundantly clear. The Examiner's continued objection to claim 20 remains unsupported.

Regarding claims 25-33, the Examiner's objection is that the preamble as directed to a "fault-tolerant system" is not supported in the claim, yet the specification describes many examples of such a system and there is no rule (cited or otherwise) that would require that the Applicant cannot claim the invention as such. Generally, these claims are readily applicable for implementations susceptible to faults, such as those involving outer-space operation in harsh environments, where new designs are evolved and implemented to correct faults. For instance, claim 25 is directed to replacing a design with a new design as a function of fitness (e.g., as relative to a fault or expected fault). The Examiner's Response to Arguments in the Final Office Action indicate only that "Limitations in the spec are not read into the claims." This response

is not understood, as no limitations need to be read into the claims; rather, the Applicant's recitation of portions of the specification is to assist the Examiner's understanding in pointing out relevant discussion in the specification. In short, the terms used in the preamble are accurate for the claimed limitations, as demonstrated in the specification, and the claim body thus clearly supports these terms.

Notwithstanding this, Applicant has amended the claim preambles to remove the term "fault-tolerant" in an effort to facilitate prosecution; however, Applicant maintains that these claims are readily applicable to such embodiments (as well as others). Per the Examiner's indication, Applicant understands that the objections will be removed.

Applicant notes that the Final Office Action indicated, in the statement of the rejection, that claims 10, 13, 15, 16, 19 and 25-33 stand rejected under 35 USC §112, second paragraph, but instead addressed claims 10, 12-13, 15-16, 18 and 25-33. Based upon discussion with the Examiner, Applicant understands that claim 19 stands rejected. For purposes of this response, Applicant has thus assumed that the rejection applies to claims 10, 12-13, 15-16, 18 and 25-33 as addressed by the Final Office Action, and claim 19 per the Examiner's indication.

The rejections of claims 10, 12-13, 15-16, 18-19 and 25-33 under 35 USC §112, second paragraph are improper because the Office Action has not shown or alleged that the limitations would not be understood by one of skill in the art, and because the limitations are clear under Section 112 and relevant law. Notwithstanding this, Applicant has amended certain claims and/or provided discussion below to facilitate both the Examiner's understanding and the prosecution of the instant application. Based upon discussion with the Examiner, Applicant understands that the following discussion and claim amendments should overcome the rejections.

Applicant has amended claim 10 in a manner consistent with original claim 10 to facilitate the Examiner's understanding of the claim.

Regarding claim 12, the Examiner's suggestion that claim 12 should depend from claim 1 because it refers to limitations in claim 1 remains confusing. Applicant notes that claim 12 depends from claim 10, which ultimately depends from claim 1. Therefore, claim 10 includes all of the limitations of claim 1 as well and, thus, the

limitations in claim 12 properly further limit claim 10, which includes all of the limitations of claim 1 via its dependency therefrom.

Applicant has amended claim 13, replacing the term “relationship.” Amended claim 13 includes limitations that meet the requirements of Section 112 and are well-supported in the specification (*e.g.*, see paragraph 0019).

Applicant has amended claim 15 in accordance with the Examiner’s suggestion. Amended claim 15 includes limitations that are well-supported in the specification (*e.g.*, see paragraph 0023).

Applicant has amended claim 16, replacing the term “relationship” with the terms “degree of agreement.” Amended claim 16 includes limitations that meet the requirements of Section 112 and are well-supported in the specification (*e.g.*, see paragraph 0019).

Regarding claims 18 and 19, the rejection (to claim 18, from which 19 depends) indicates that it is not clear whether Applicant is intending to claim the limitations in view of the specification objection. However, the specification objection has been removed. Therefore, Applicant understands that the rejection of claim 18 should also be removed. Should the rejection be maintained, Applicant requests an opportunity to respond thereto.

Regarding claims 25-33, the Examiner has rejected the claims in view of the well-understood and widely-used terms “configured and arranged.” Here, the term “arranged” may apply, for example, to the arrangement of circuits or related structures as shown in the figures or described in the specification (*e.g.*, electrically or communicatively coupled in an arrangement). Notwithstanding this, Applicant has amended the claims to remove the terms “configured and arranged” to facilitate prosecution, and understands per the Examiner’s indication that these rejections will be removed.

Applicant traverses the rejection of claims 3, 13, 15, and 16 under 35 USC §112, first paragraph, because the written description requirement does not require word-for-word correspondence between the claims and specification or that the Applicant “describe exactly the subject matter claimed” (with the understanding that

certain claims may apply to various embodiments). Applicant further incorporates the response filed with the previous Office Action Response of record. Notwithstanding this, Applicant has amended the claims as follows to facilitate prosecution, and understands per the Examiner's indication that no amendment to the specification is necessary.

Regarding claim 3, the specification describes using previous generations of designs in fitness evaluation, and further describes various weighting approaches. As previously indicated, Applicant maintains that one of skill in the art would understand the claimed limitations as read in connection with the specification and otherwise. For example, weights are assigned to designs and to their respective fitness levels as determined from generation to generation (see, e.g., paragraph 0020). As to assigning weights to an initial generation (per the Examiner's question), there is no such claim limitation and Applicant is therefore uncertain as to what the Examiner is referring to in his question.

Regarding claims 13 and 16, the term "relationship" has been removed from the claim. As the Section 112(1) rejection was based upon this term, Applicant understands that the Section 112(1) rejection of claims 13 and 16 is no longer applicable.

Claim 15 has also been amended in a manner such that the terms "biasing a probability," which were the subject of the Section 112(1) rejection, are no longer present. Applicant therefore understands that the Section 112(1) rejection of claim 15 is no longer applicable.

In view of the above and the Examiner's indications, Applicant understands that the Section 112(1) rejections of claims 3, 13, 15 and 16 will be removed.

The Office Action failed to show that claims 21-24 are directed to non-statutory subject matter of 35 USC § 101. The rejection is respectfully traversed because the Office Action does not establish a *prima facie* case that the invention as a whole is directed solely to an abstract idea or to manipulation of abstract ideas or does not produce a useful result. Moreover, as indicated in the previous Office Action Response, the claimed limitations are directed to the use of signals (e.g., electronic



signals) for evolving a population of designs (e.g., hardware designs) that implement or generate signals. Notwithstanding this, in an effort to facilitate prosecution, Applicant has amended claims 21-24 to include discussion of the aforesaid designs and signals, as are consistent with the original claims and with the understanding of those skilled in this art. In view of the above and per the Examiner's indications, Applicant understands that the Section 101 rejection will be removed.

The Section 102(e) rejection of claims 1-17 and 21-24 is traversed because the Final Office Action, as with the previous Office Action of record, fails to show that the claims are anticipated by US patent publication 2003/0050902 to Buczak et al. ("Buczak") under 35 USC §102(e). In short, Buczak's "convergence criteria" as used to determine when to stop an algorithm does not disclose limitations directed to determining a consensus result as a function of generated result signals from each of a population of designs. Buczak further fails to disclose other claimed limitations, such as those directed to generating a result signal for each design in a population of designs, and determining the fitness level of any design as a function of a consensus result.

The Examiner's response in the Final Office Action focuses upon Buczak's term "convergence criteria" and the Examiner's interpretation of the term to be the same as the claimed determined consensus result, then goes on to suggest that Buczak's "defined fitness criteria" is also the claimed "consensus." While it is unclear as to which of these aspects of the Buczak reference the Examiner is asserting to be the same as the claimed consensus result, neither of these aspects correspond completely to the claimed limitations. The Final Office Action has stopped short of showing correspondence to the claimed limitations (i.e., how either the "convergence criteria" or "defined fitness criteria" can function as the claimed consensus result), and further erroneously relies upon Buczak's discussion of an algorithm termination point as teaching of the claimed consensus determination. That is, while the Examiner has made arguments as to how Buczak could relate to some sort of "consensus," these arguments do not describe how Buczak relates to the claimed limitations, and

specifically how the claimed limitations directed to a consensus result are both obtained and used. The following more particularly addresses this issue.

Referring to claim 1 of the instant invention and as relevant to claim 21 (and claims depending from either claim), the claimed consensus result is determined using at least two generated result signals from signals generated for each design in a population of designs. The consensus result is further subsequently used to determine an associated fitness level of each design, and to select a design for replacement. In contrast, Buczak's convergence criteria is determined independently from any actual value of the result signals, and the Examiner's indicated consensus (as being a condition where there is "no change in the fittest individual") is not used to determine any fitness level or subsequent selection of a design for replacement. Referring to paragraph 0047 in the Buczak reference, fitness criteria is predefined when used to set the convergence criteria, and in most instances, a number of generations or other generation-related occurrence is used as convergence criteria (e.g., no change as above). In this regard, Buczak's alleged consensus is not determined as a function of generated result signals; rather, it is a predetermined value (see, e.g., paragraph 0047 in Buczak). This is consistent with the Examiner's response in the Final Office Action, which indicates that fitness is based on "defined fitness criteria" (i.e., and not upon generated result signals). In this regard, Buczak's independently-determined convergence criteria, which are simply used as a point at which to stop an algorithm and at which separate "fitness" checks are performed relative to predefined criteria, cannot correspond to the claimed limitations directed to determining a consensus result using two generated result signal values.

In view of the above, the Section 102(e) rejections are improper and must be reversed.

The Final Office Action does not show that claims 25-28 and 30-33 are anticipated by SMC-IT 2003, July 13-16, 2003 "Evolvable Systems for Space Applications" to Lohn *et al.* ("Lohn") under 35 USC §102(a). The rejection is respectfully traversed because the Office Action does not show that Lohn provides correspondence to all of the limitations. Specifically, Lohn does not determine any

consensus result as a function of generated result signals as claimed, nor does it use the consensus result as claimed; as with the Buczak reference above, Lohn relies on externally-supplied parameters (see third paragraph, Section 2.1) in its fitness function. In this regard, Lohn's "externally supplied energies and forces" as used for determining a consensus result do not correspond to the claimed limitations directed to determining a consensus result as a function of at least two result signals generated from designs in a population. In this context, Lohn's "externally supplied energies and forces" are also not used in determining an associated fitness level of designs. As with the Section 102(e) rejection, it appears that the rejection attempts to show correlation between the cited reference and a general consensus, but stops short of showing how the asserted "consensus" teachings in the Lohn reference operate as claimed. In this regard, the Office Action has not shown correspondence to the limitations in independent claim 25, and therefore to claims 26-28 and 30-33, which depend therefrom. The Section 102(a) rejections must therefore be removed

The Final Office Action does not establish that claim 29 is unpatentable under 35 USC §103(a) over Lohn and Management Science, Vol. 45, No. 5, May 2001, "Parallel and Sequential Testing of Design Alternatives" to Loch et al. ("Loch"). The rejection is respectfully traversed because the Office Action does not show that all the limitations are suggested by the references, fails to provide proper motivation for modifying the teachings of Lohn with teachings of Loch, and fails to show that the combination could be made with a reasonable likelihood of success.

As is consistent with the above discussion of the Lohn reference, and as claim 29 depends from claim 25, claim 29 should also be allowable as is consistent with the M.P.E.P. in regard to claims that depend from allowable independent claims. In this regard, no further discussion of the Section 103 rejection should be necessary. However, Applicant further submits that the Final Office Action has not described how the Lohn reference corresponds to all of the limitations of claim 29 and claim 25 from which it depends, in the new Section 103 rejection. Furthermore, the Final Office Action has not shown how the Lohn reference would function with the sequential programming of the Loch reference. For instance, it is unclear as to how Lohn's

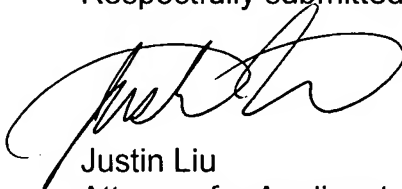
approach could work with a sequential programming application. While this may be possible, the Final Office Action has not described how Lohn would function, and Applicant cannot ascertain the same.

In view of the above, the rejection of claim 29 is also improper and should be reversed.

### CONCLUSION

Reconsideration and a notice of allowance are respectfully requested in view of the Amendments and Remarks presented above. If the Examiner has any questions or concerns, a telephone call to the undersigned is invited.

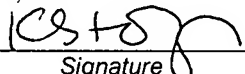
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*I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450, on October 3, 2007.*

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